Fig.1

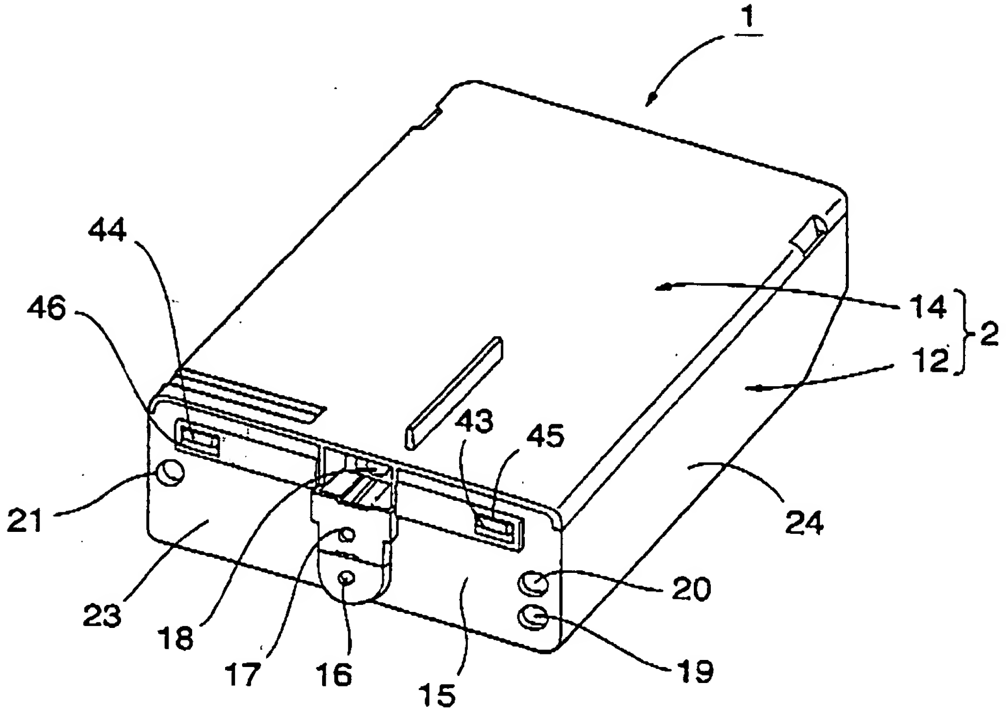


Fig.2

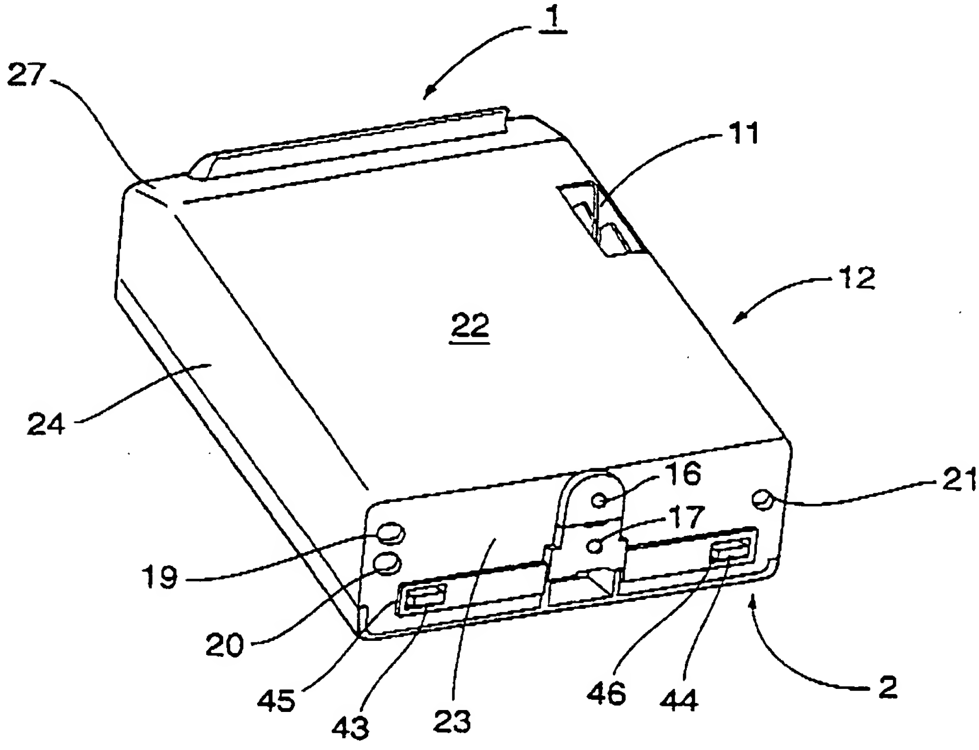


Fig.3

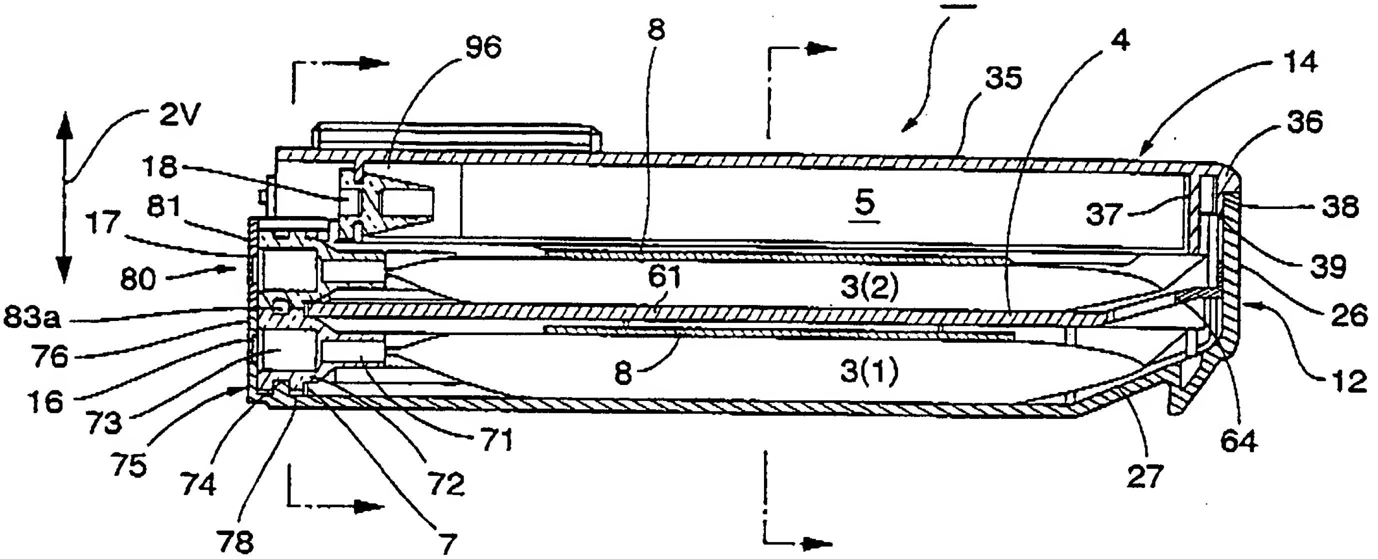

1
96
8
35
4
14
2V
18
36
81
17
5
37
38
80
61
3(2)
39
83a
26
76
8
3(1)
12
16
73
71
64
75
72
27
74
78
7

Fig.4

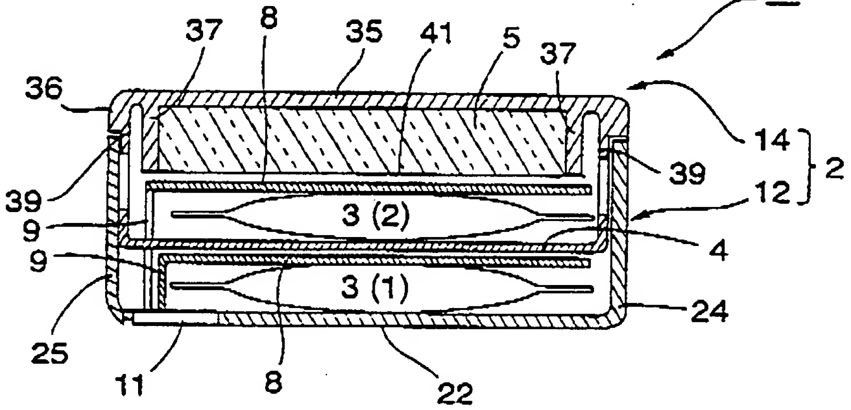

1
37
8
35
41
5
37
36
14
39
39
2
12
9
3 (2)
4
9
3 (1)
24
25
11
8
22

Fig.6

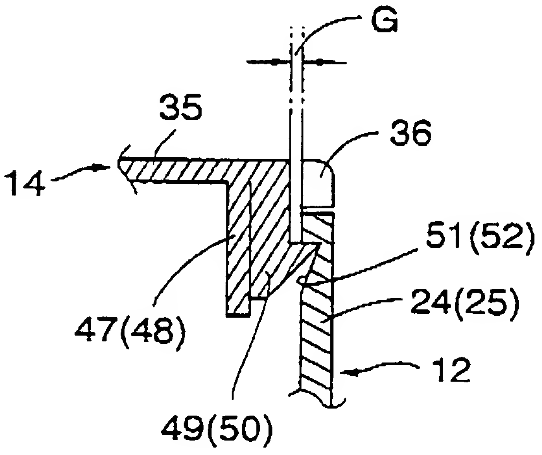
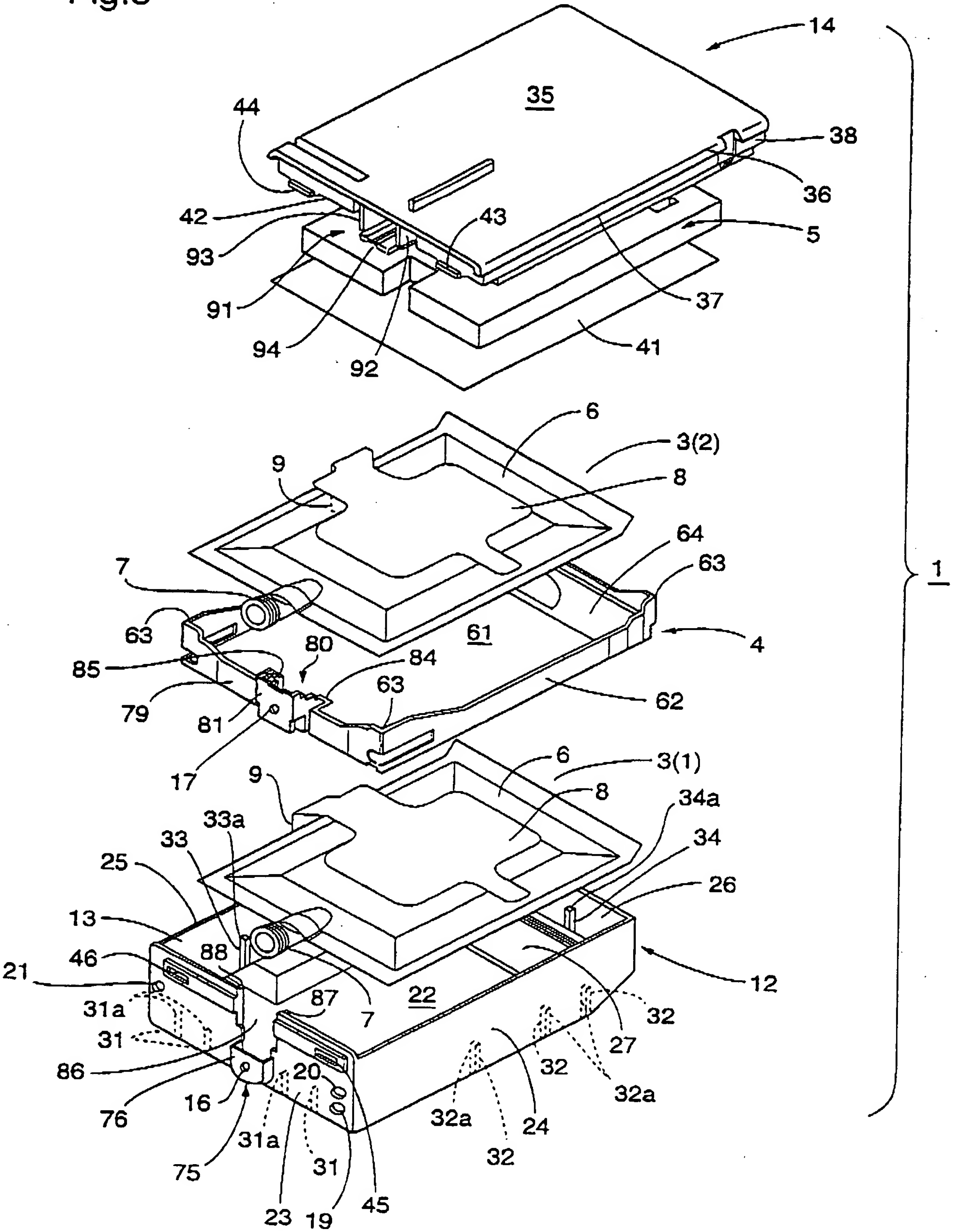
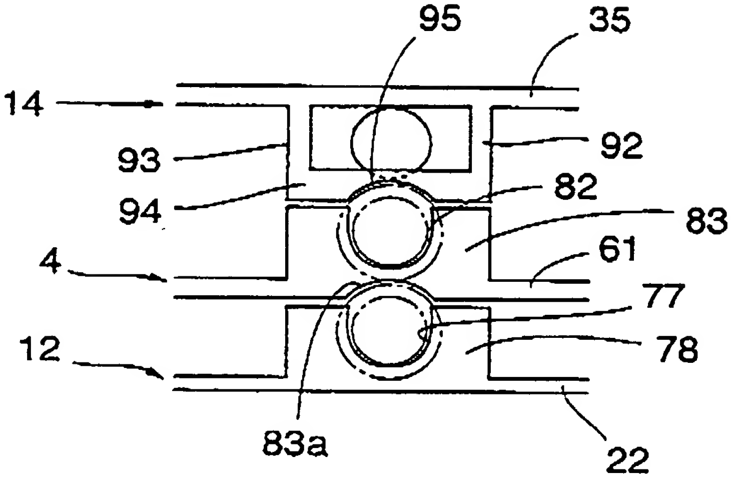

G
35
36
14
51(52)
24(25)
47(48)
12
49(50)

Fig.5


14
35
44
38
36
42
43
93
5
91
37
94
41
92
6
3(2)
9
8
64
7
63
1
63
61
4
85
80
84
63
79
81
62
17
6
9
3(1)
8
34a
33a
33
34
25
26
13
88
46
21
12
22
31a
87
32
31
7
27
86
20
32
76
16
32a
24
32a
31a
32
75
31
45
23
19

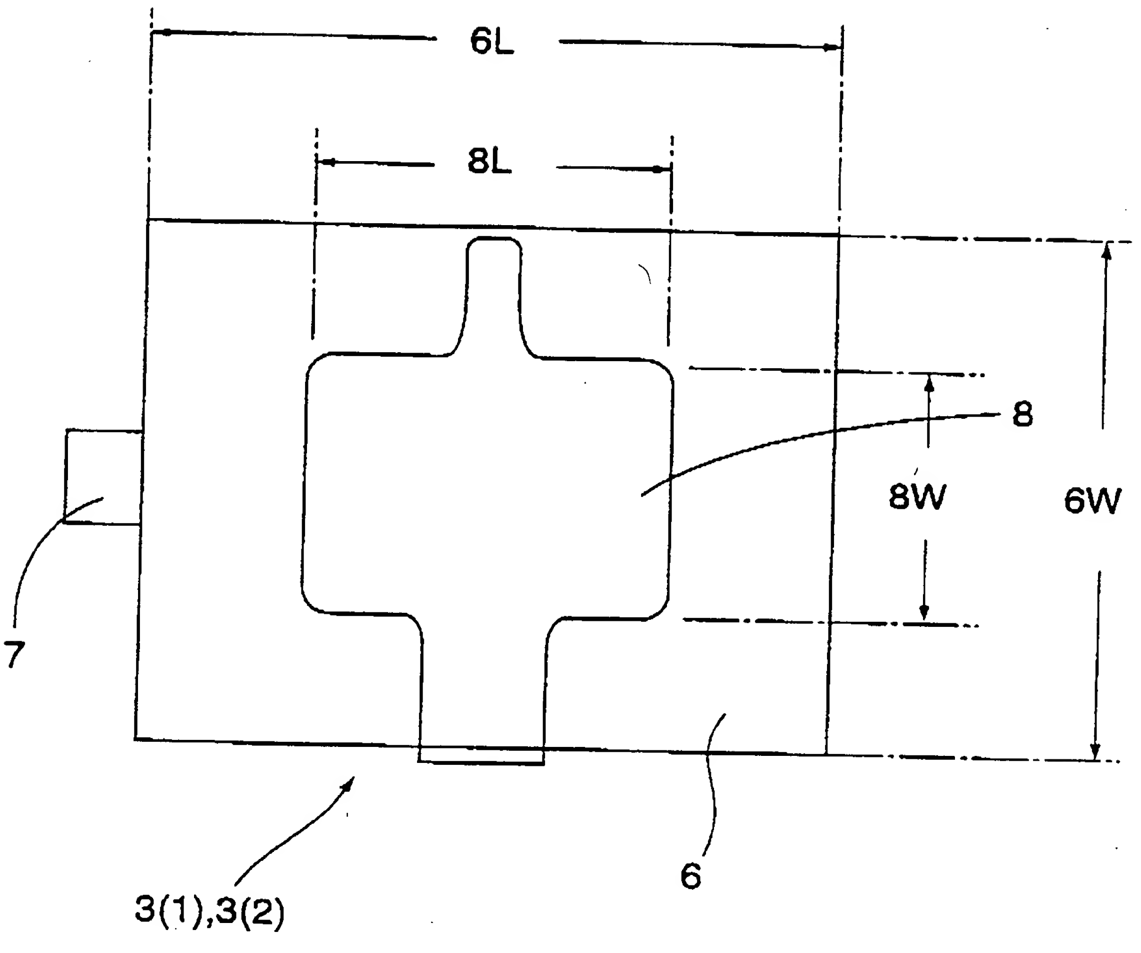
09627342.071001

Fig.7


95
35
14
93
92
94
82
83
4
61
77
12
78
83a
22

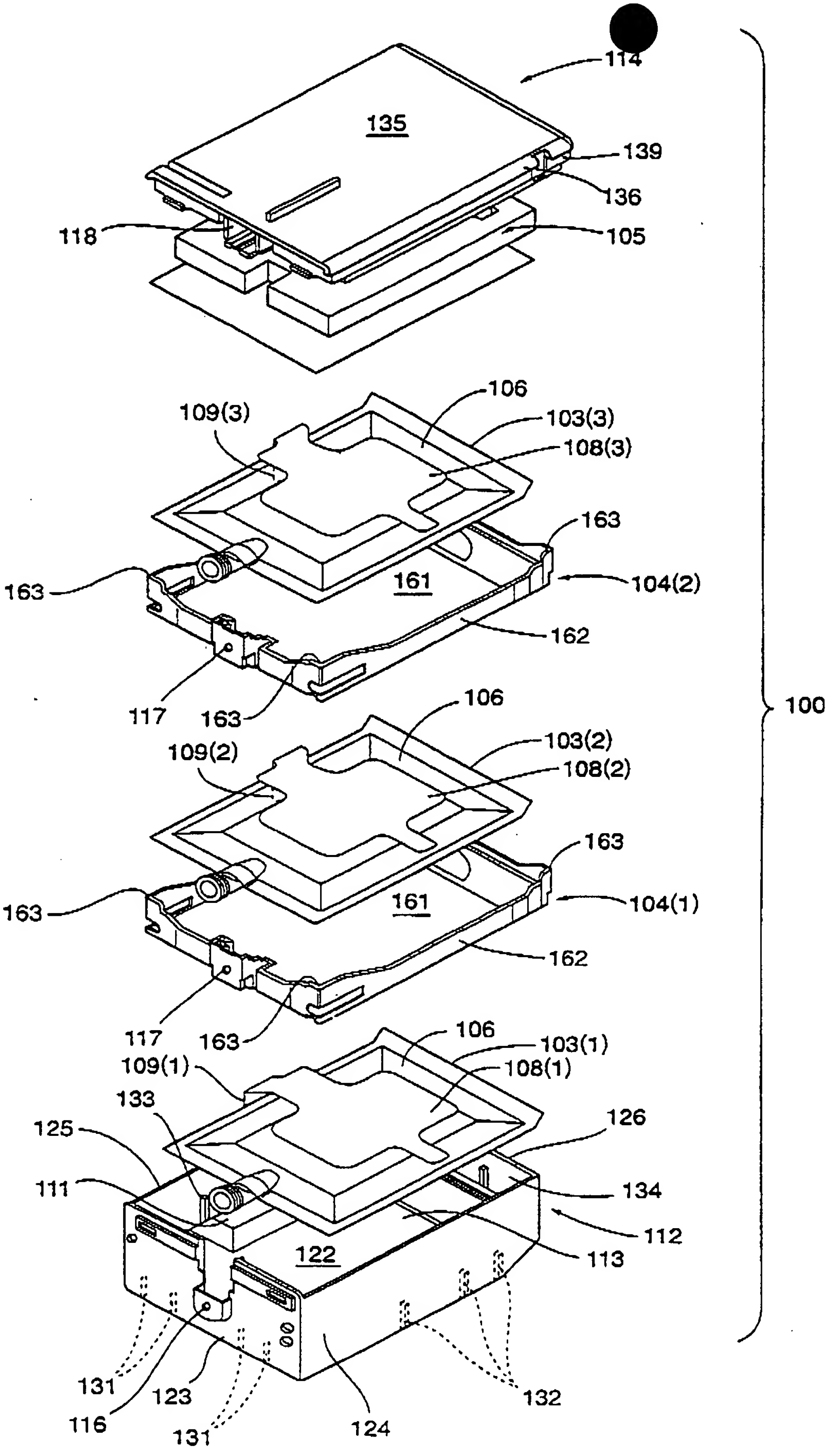
09774245 .013001

Fig.8


6L
8L
8
8W
6W
7
3(1),3(2)
6

09771942 .013001

Fig.9


114
135
139
136
118
105
106
109(3)
103(3)
108(3)
163
163
104(2)
161
162
117
163
100
106
103(2)
109(2)
108(2)
163
163
104(1)
161
162
117
163
106
103(1)
109(1)
108(1)
133
125
126
111
134
112
122
113
131
123
116
131
124
132

09572946.013001

Fig.10

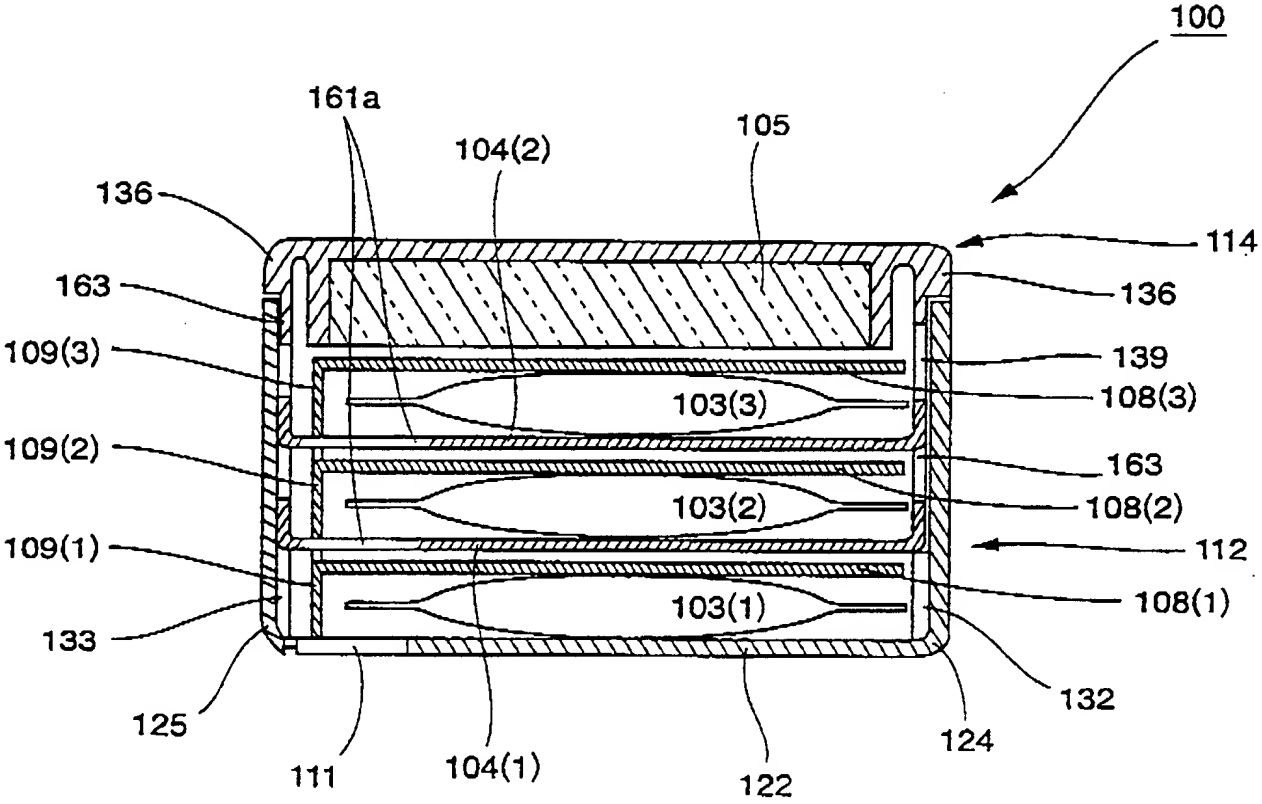
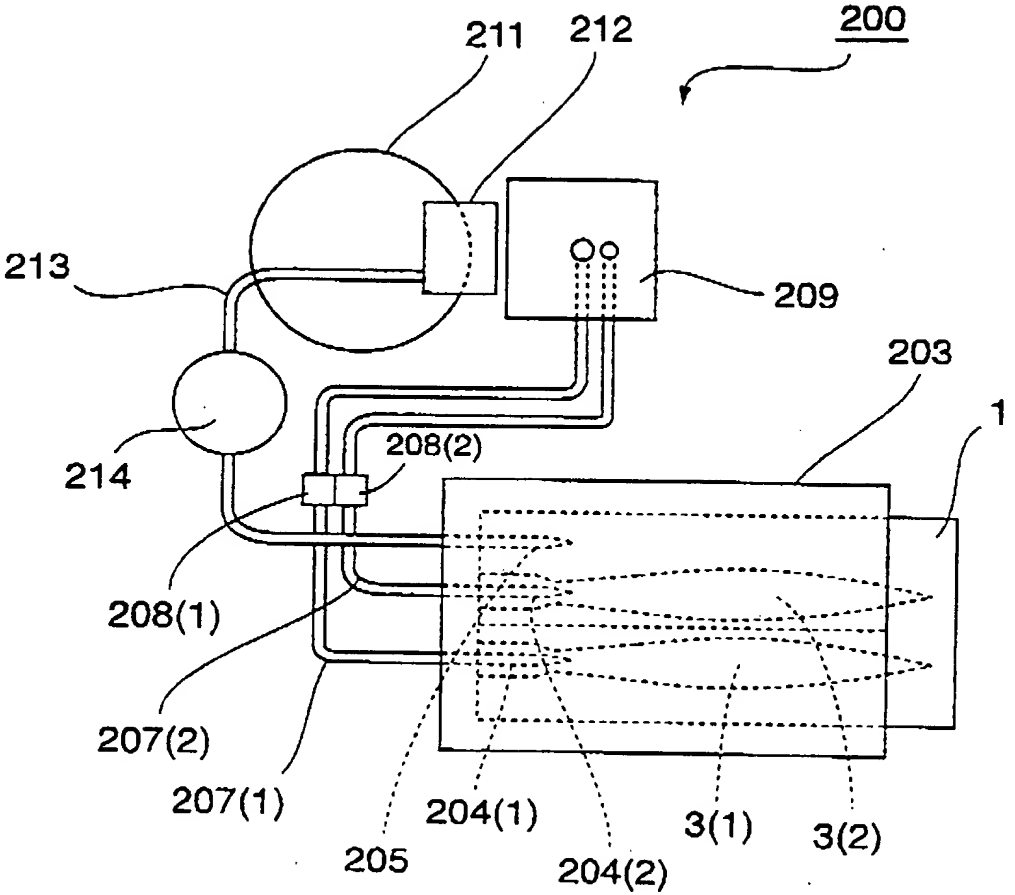


Fig.11



211
212
200
213
209
203
1
214
208(2)
208(1)
207(2)
207(1)
205
204(1)
204(2)
3(1)
3(2)

09721643.010501

Fig.12

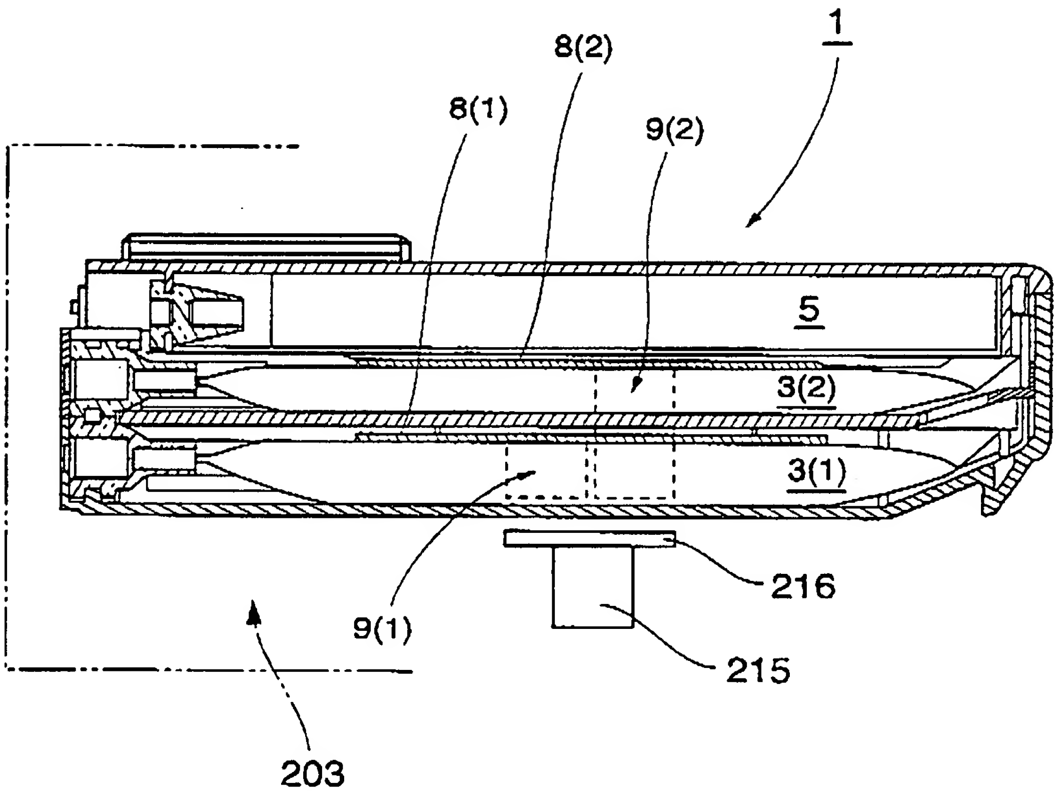

1
8(2)
8(1)
9(2)
5
3(2)
3(1)
216
215
9(1)
203

Fig.13

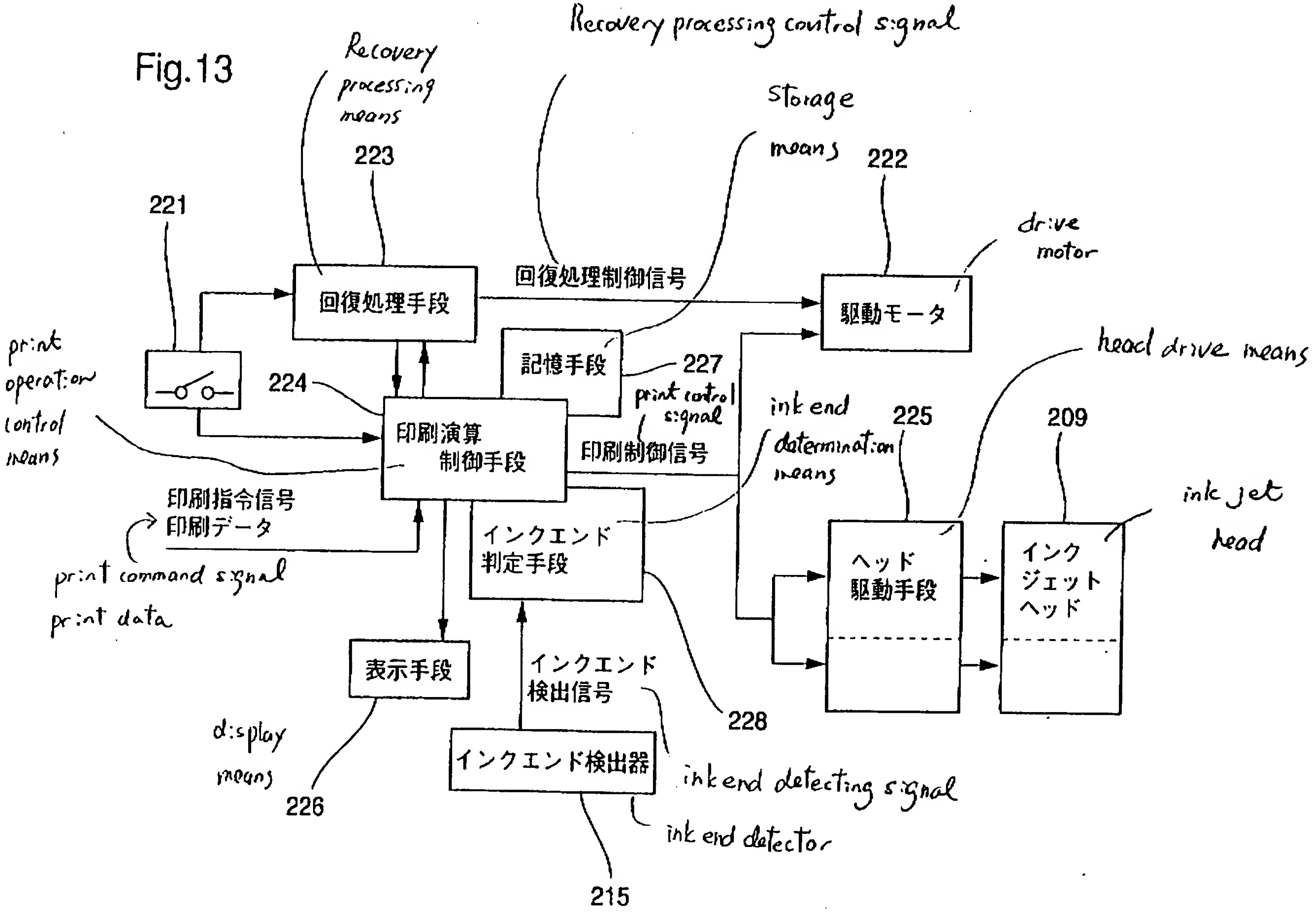

Recovery processing control signal
Recovery processing means
223
221
Storage means
222
drive motor
回復処理制御信号
回復処理手段
駆動モータ
記憶手段
227
print control signal
print operation control means
224
印刷演算制御手段
印刷制御信号
ink end determination means
head drive means
225
209
ink jet head
印刷指令信号
印刷データ
print command signal
print data
インクエンド判定手段
ヘッド駆動手段
インクジェットヘッド
表示手段
インクエンド検出信号
228
display means
226
インクエンド検出器
ink end detecting signal
ink end detector
215

Fig.14

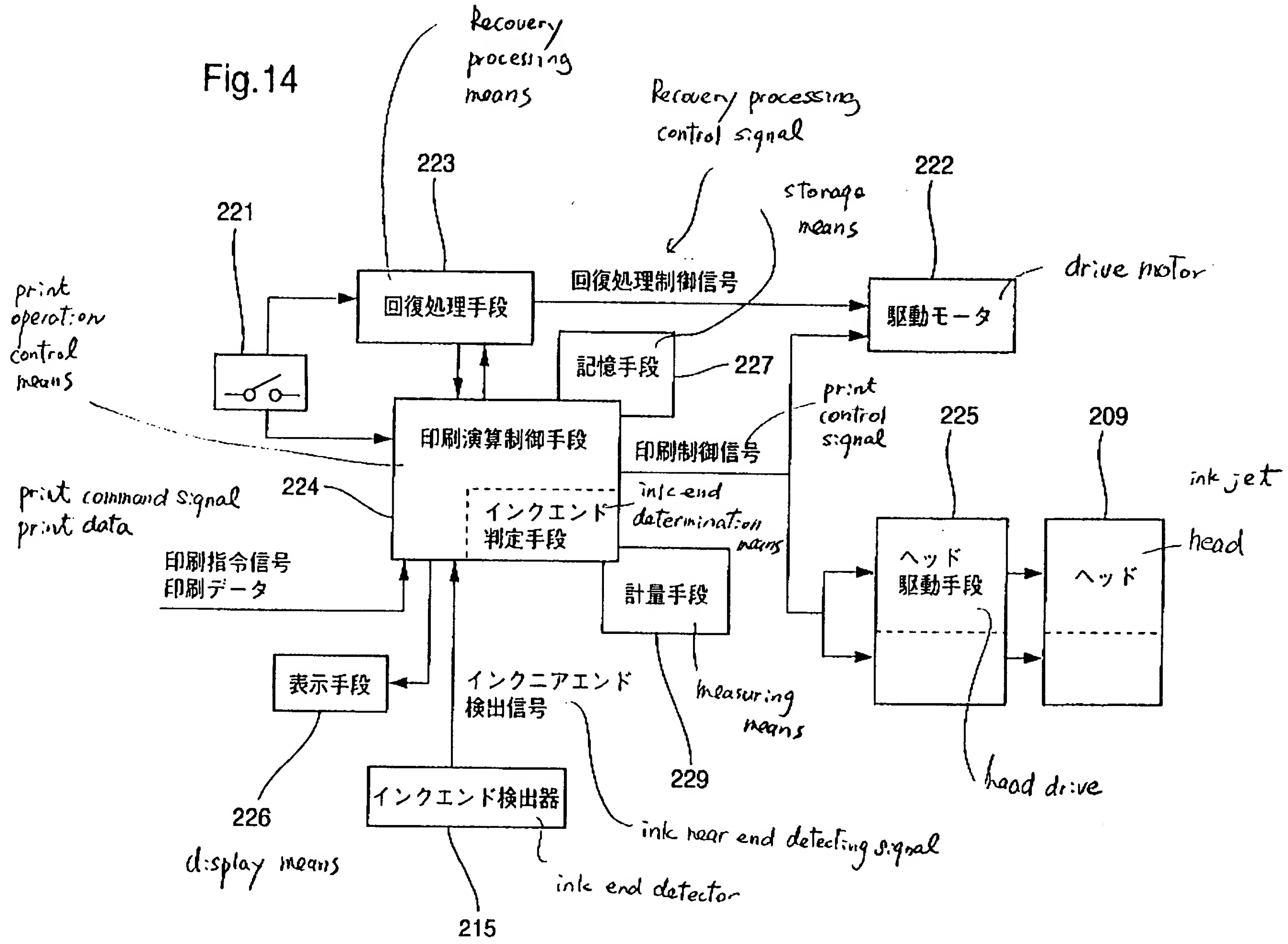

Recovery processing means
Recovery processing control signal
storage means
drive motor
223
222
221
回復処理手段
回復処理制御信号
駆動モータ
print operation control means
記憶手段
227
print control signal
225
209
印刷演算制御手段
印刷制御信号
ink jet
print command signal
print data
224
インクエンド判定手段
ink end determination means
head
ヘッド
ヘッド駆動手段
印刷指令信号
印刷データ
計量手段
表示手段
インクニアエンド検出信号
measuring means
229
head drive
226
インクエンド検出器
ink near end detecting signal
display means
ink end detector
215

Fig.15

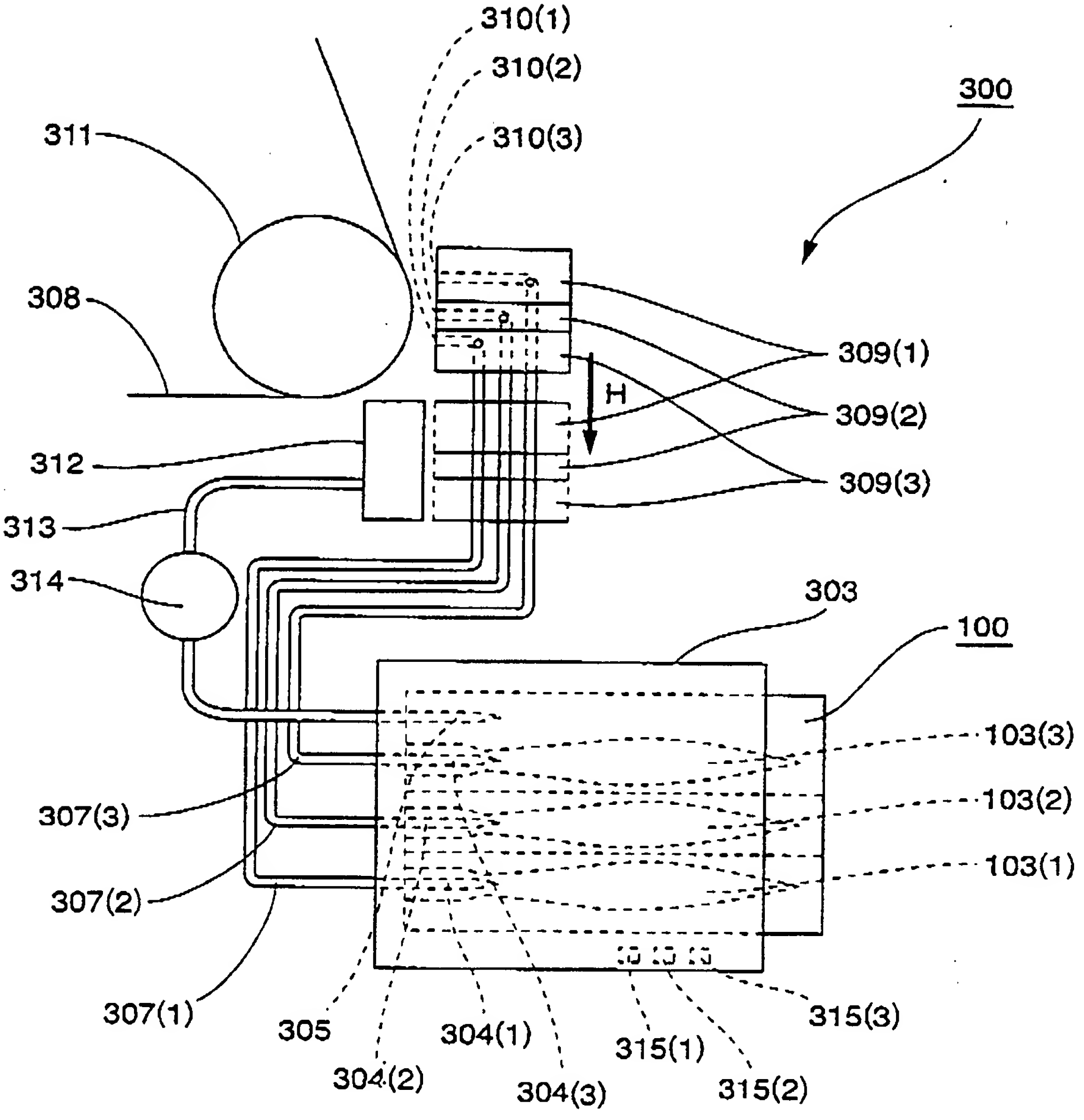
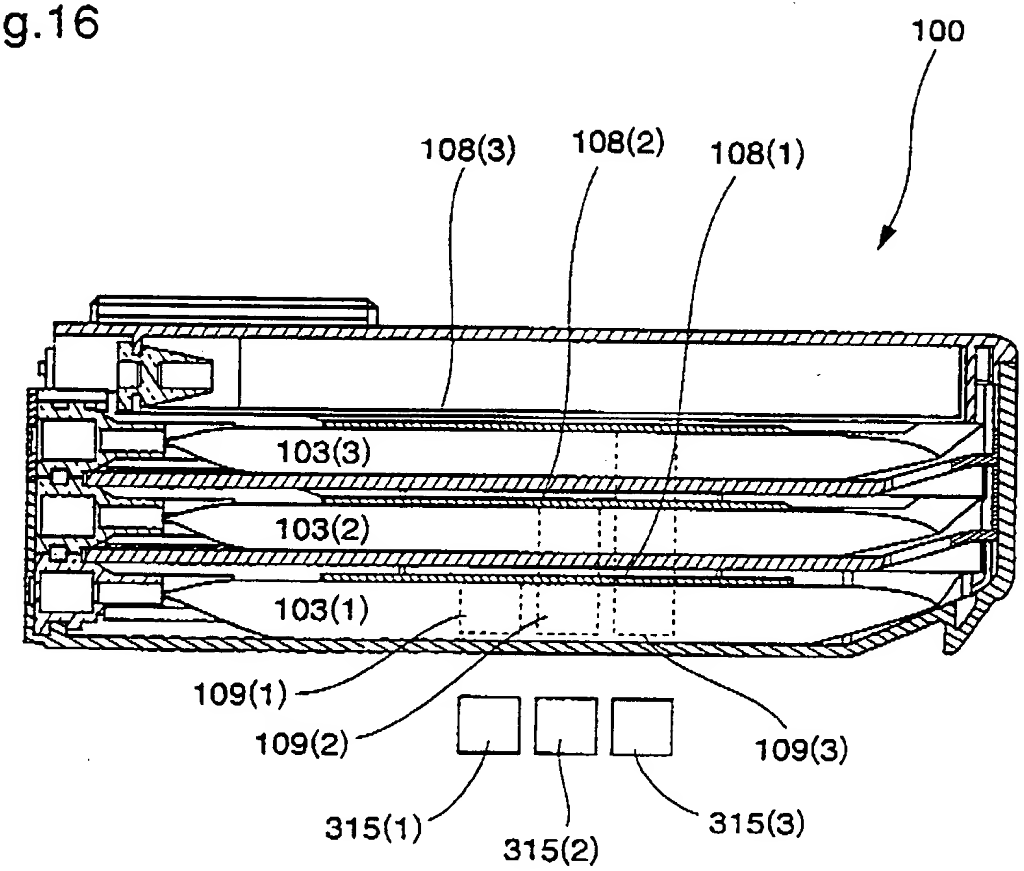

H

Fig.16


100
108(3)
108(2)
108(1)
103(3)
103(2)
103(1)
109(1)
109(2)
109(3)
315(1)
315(2)
315(3)

09574546 .041001

Fig.17

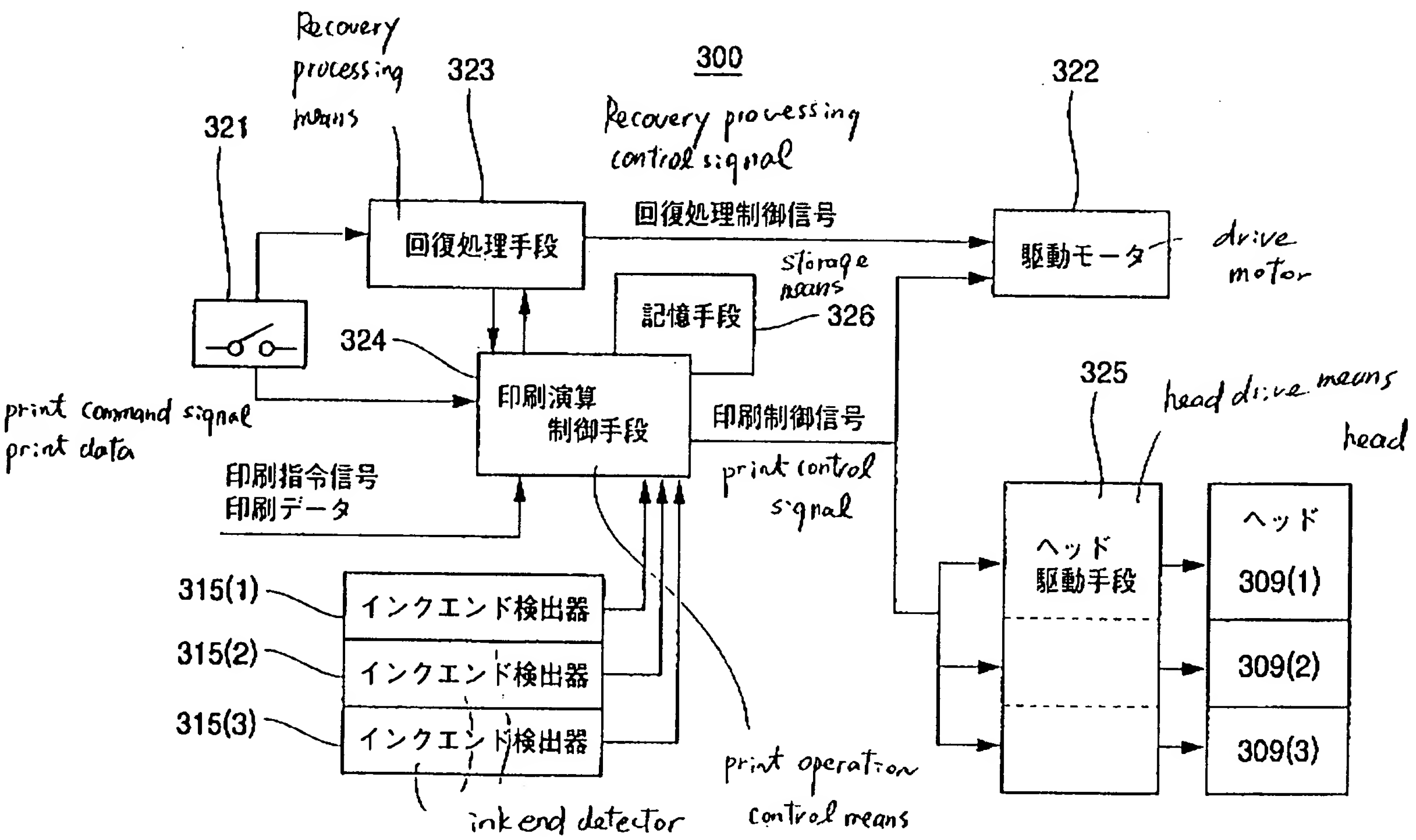
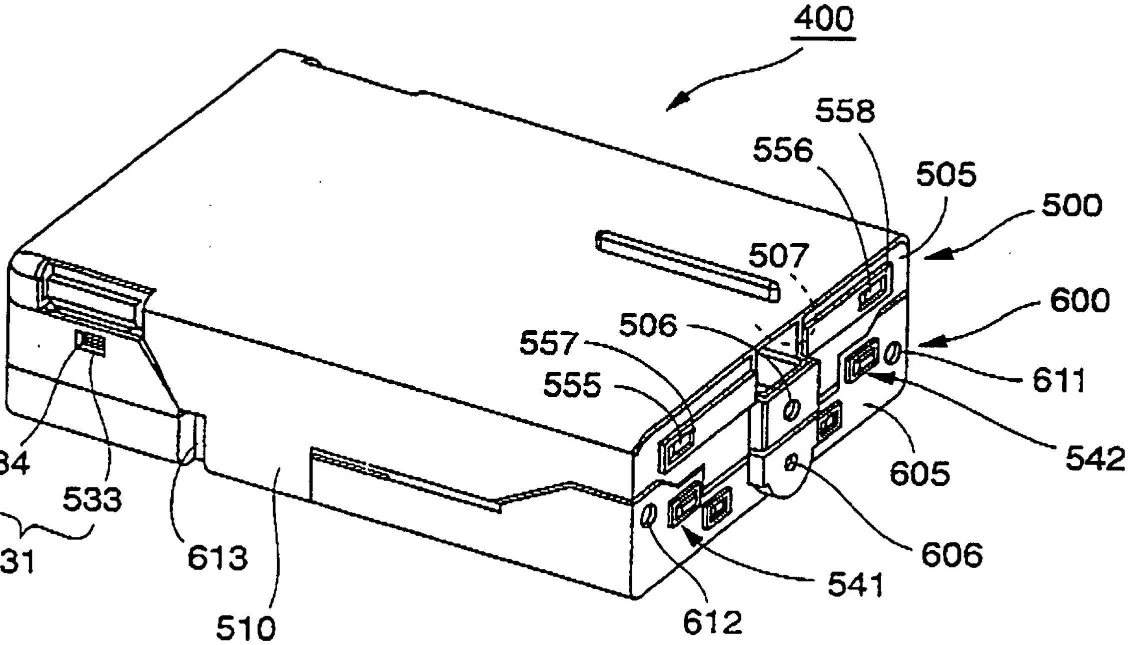
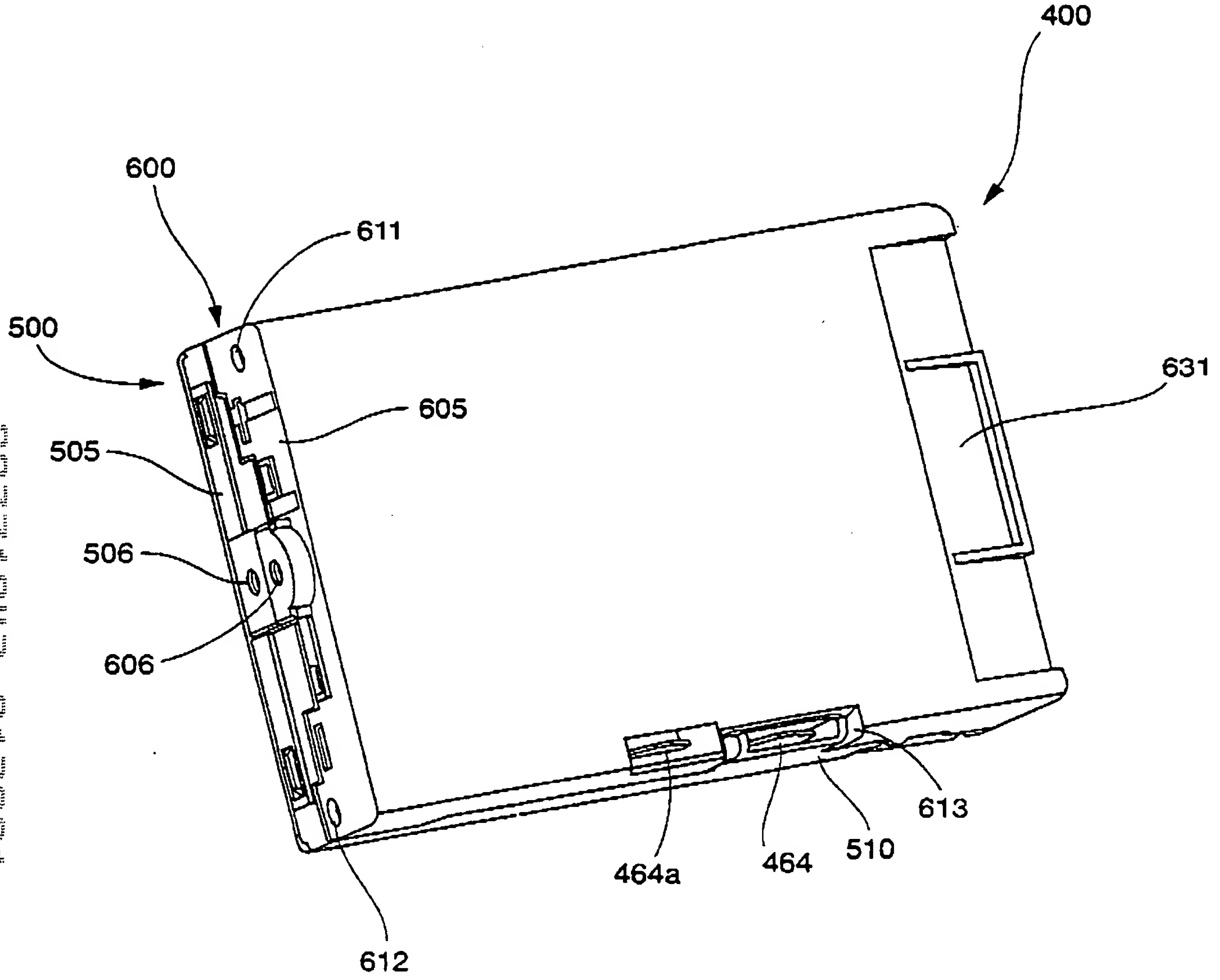

300
321
Recovery processing means
323
回復処理手段
Recovery processing control signal
回復処理制御信号
322
駆動モータ
drive motor
記憶手段
storage means
326
324
印刷演算
制御手段
print command signal
print data
印刷指令信号
印刷データ
印刷制御信号
print control signal
325
head drive means
head
ヘッド
駆動手段
ヘッド
309(1)
309(2)
309(3)
315(1)
315(2)
315(3)
インクエンド検出器
インクエンド検出器
インクエンド検出器
ink end detector
print operation control means

Fig.18


400
558
556
505
500
507
600
506
557
611
555
542
605
534
533
606
531
613
541
510
612

09724346.013001

Fig.19


400
600
611
500
605
631
505
506
606
613
510
464
464a
612

09771942 .013001

09771942.015001

Fig.20

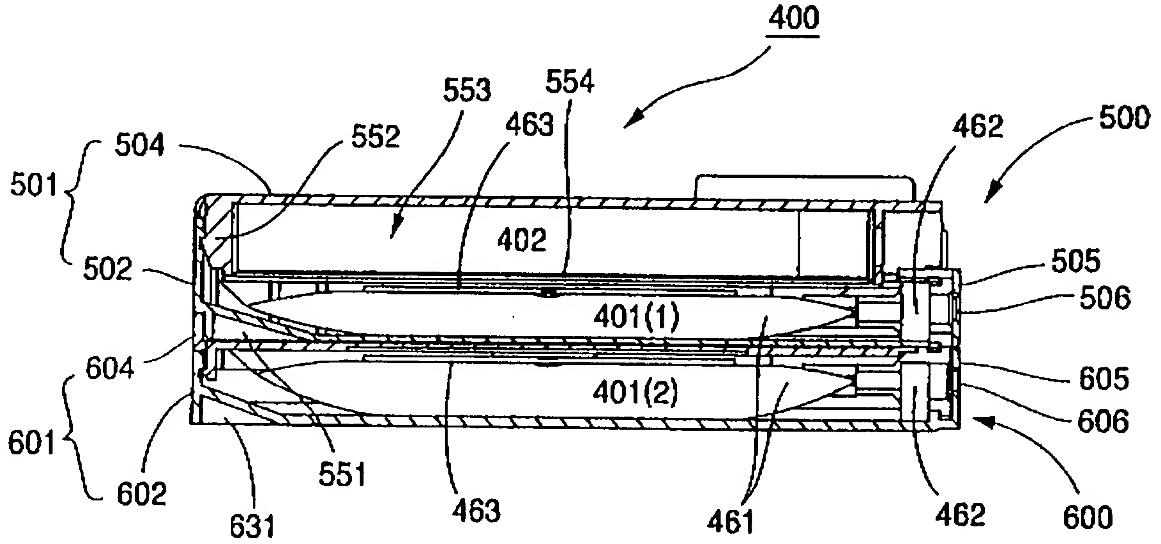
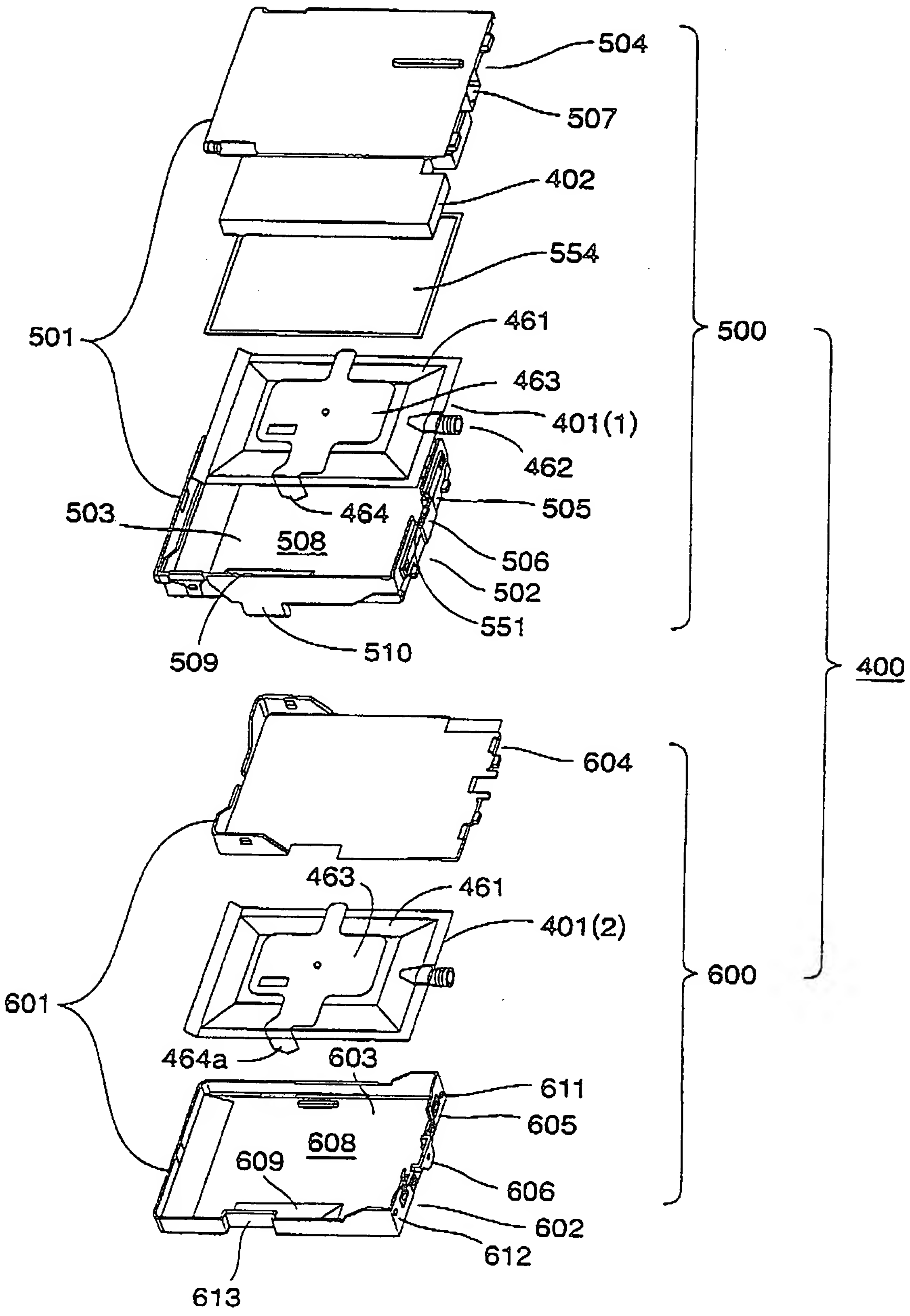

400
553
554
463
552
504
501
502
402
462
500
505
506
401(1)
604
601
401(2)
605
606
602
631
551
463
461
462
600

Fig.21


504
507
402
554
461
463
401(1)
462
501
500
464
505
503
508
506
502
551
509
510
400
604
463
461
401(2)
600
601
464a
603
611
605
608
609
606
602
612
613

09574345.040501

Fig.22

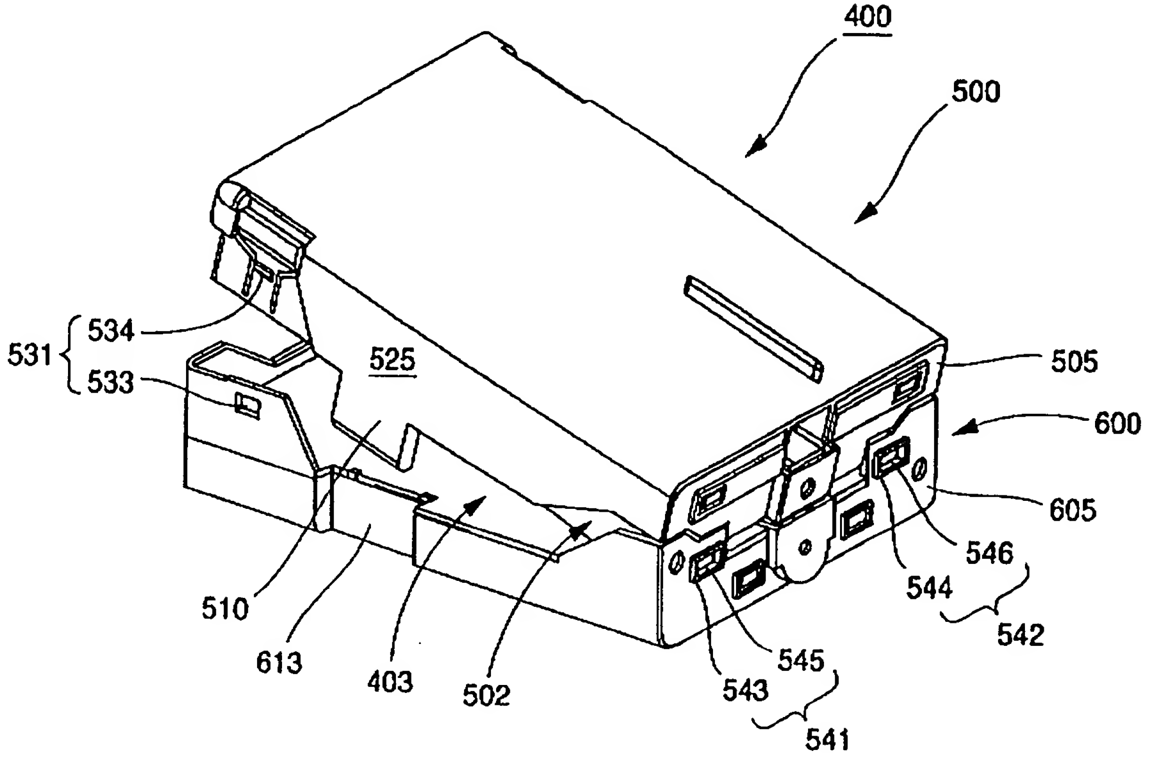
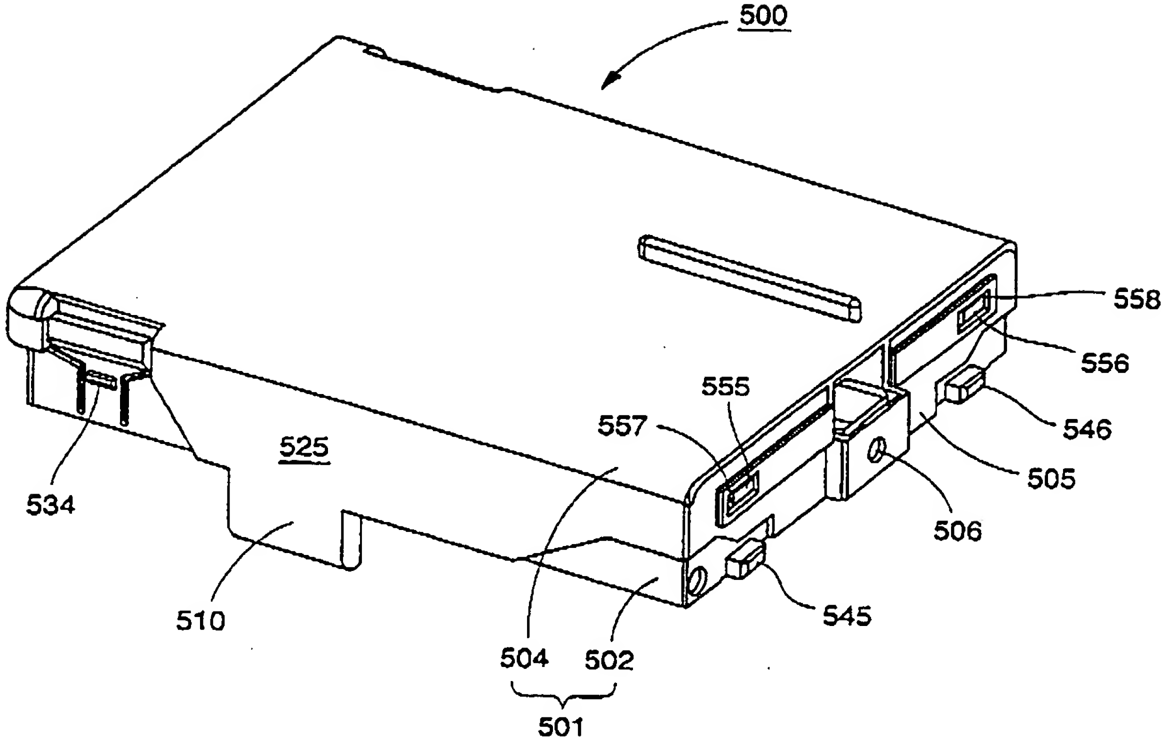


Fig.23


500
558
556
555
557
546
525
505
534
506
545
510
504
502
501

10053045.072602

Fig.24

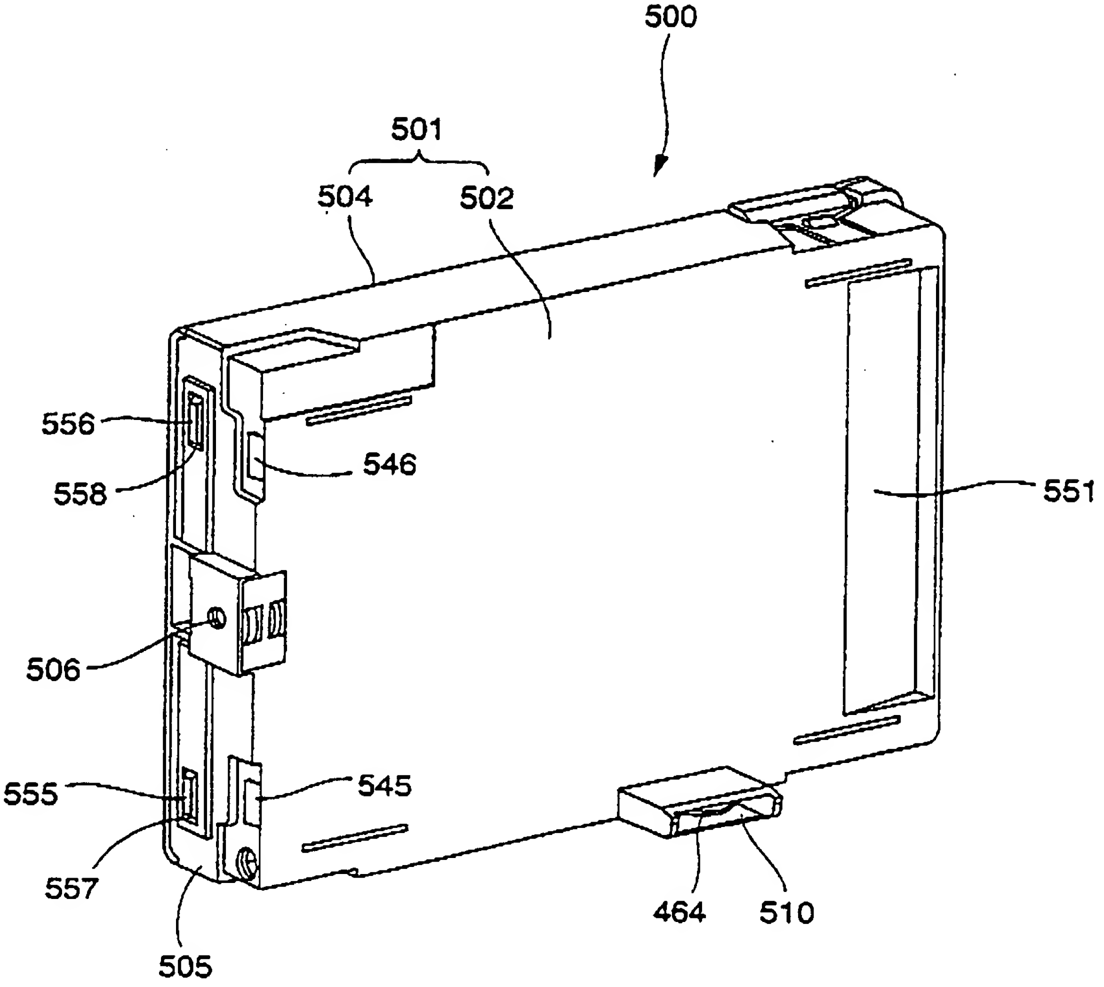
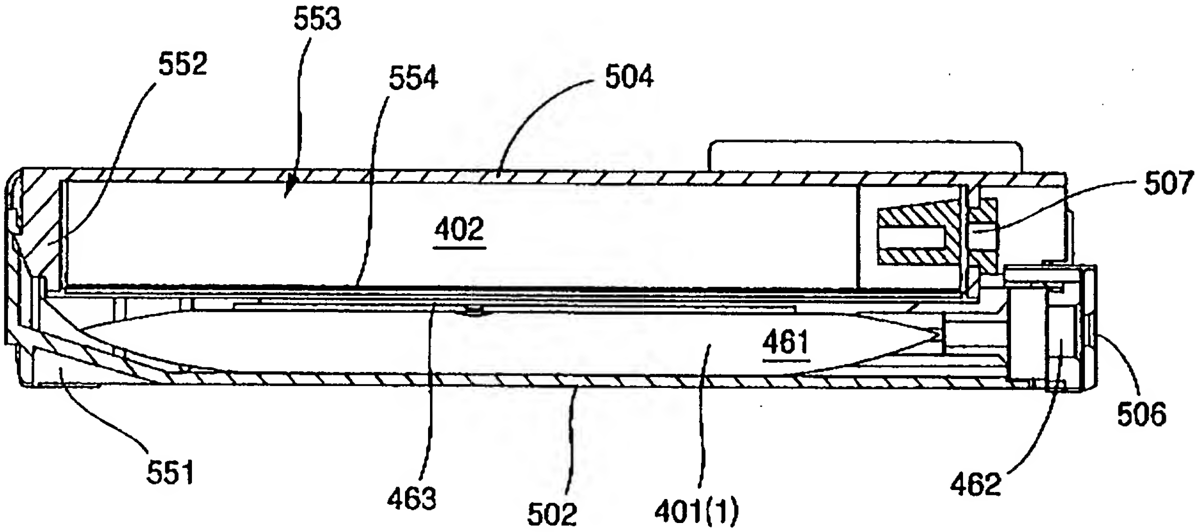

500
501
504
502
556
558
546
551
506
555
545
557
505
464
510

Fig.25


553
552
554
504
507
402
461
506
551
463
502
401(1)
462

09771942.013001

Fig.26

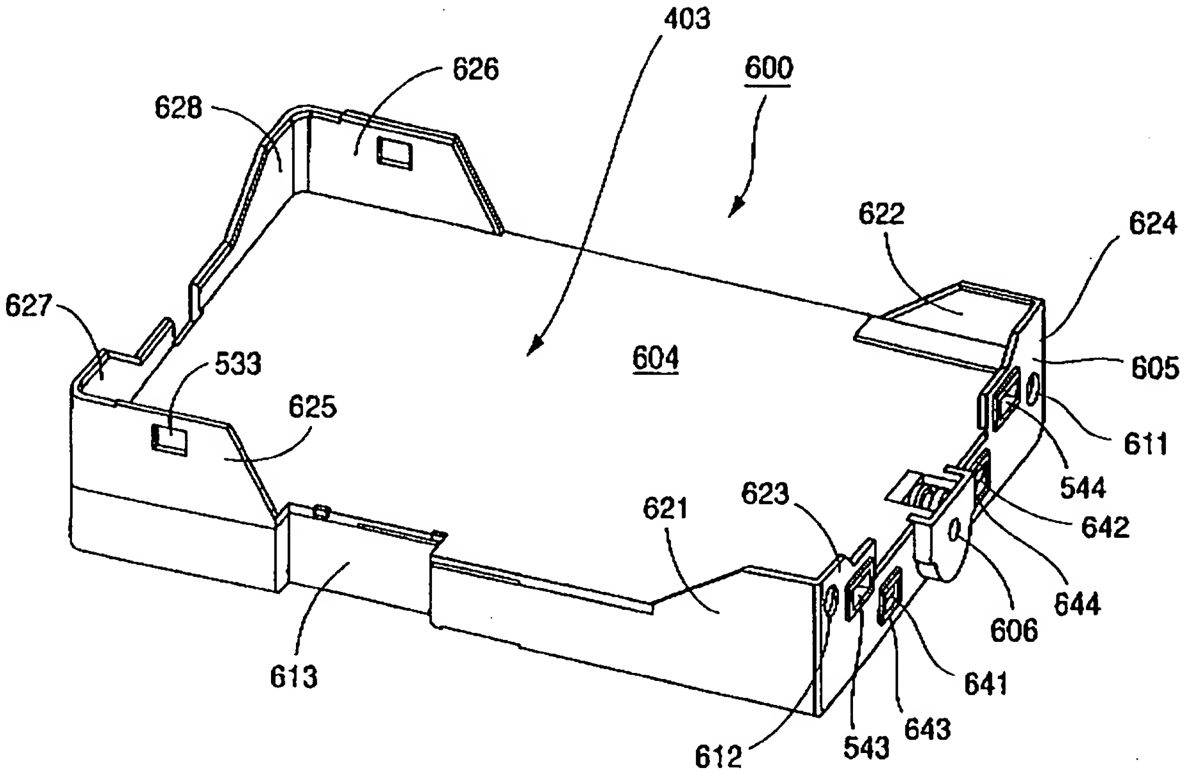
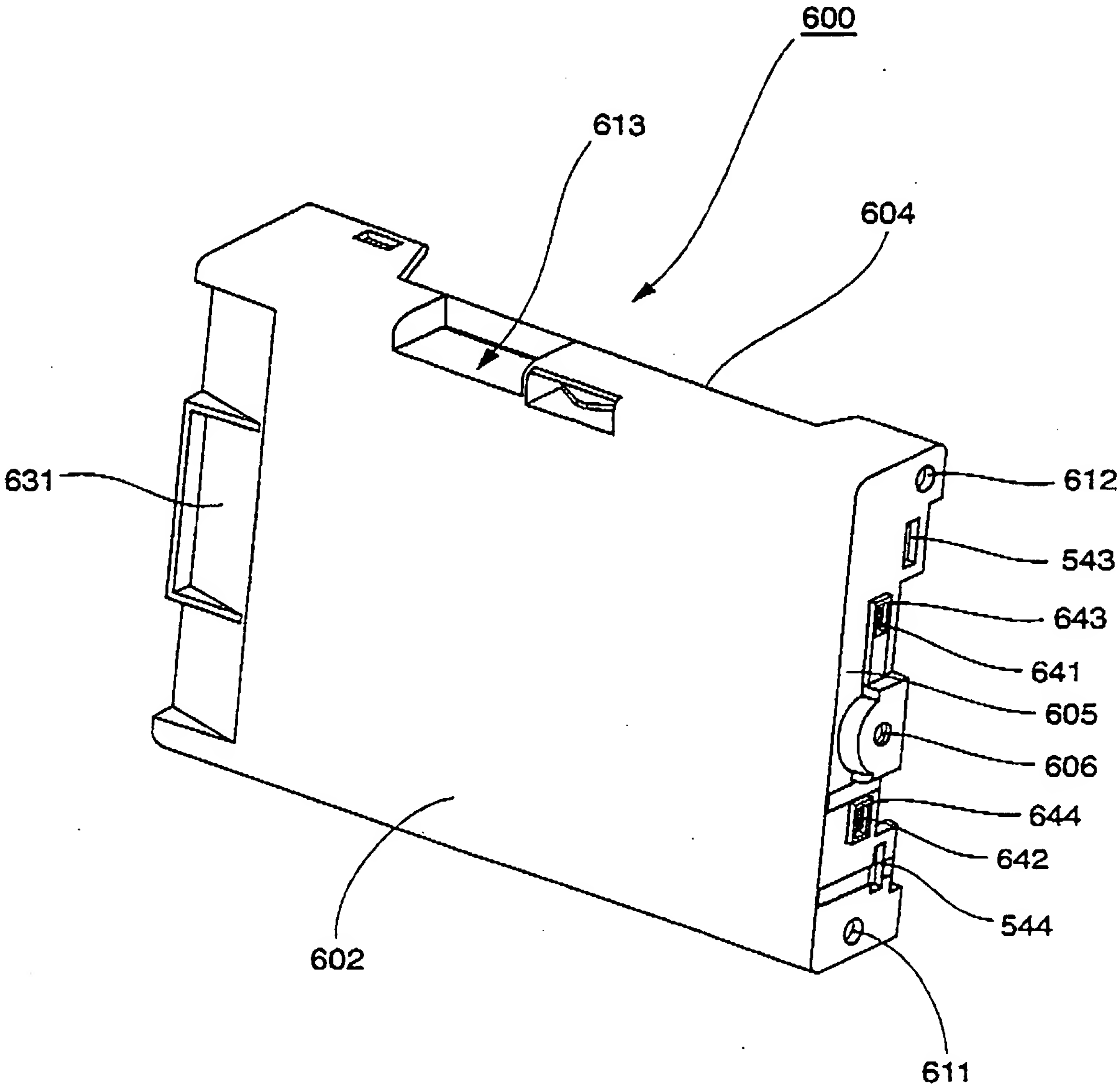
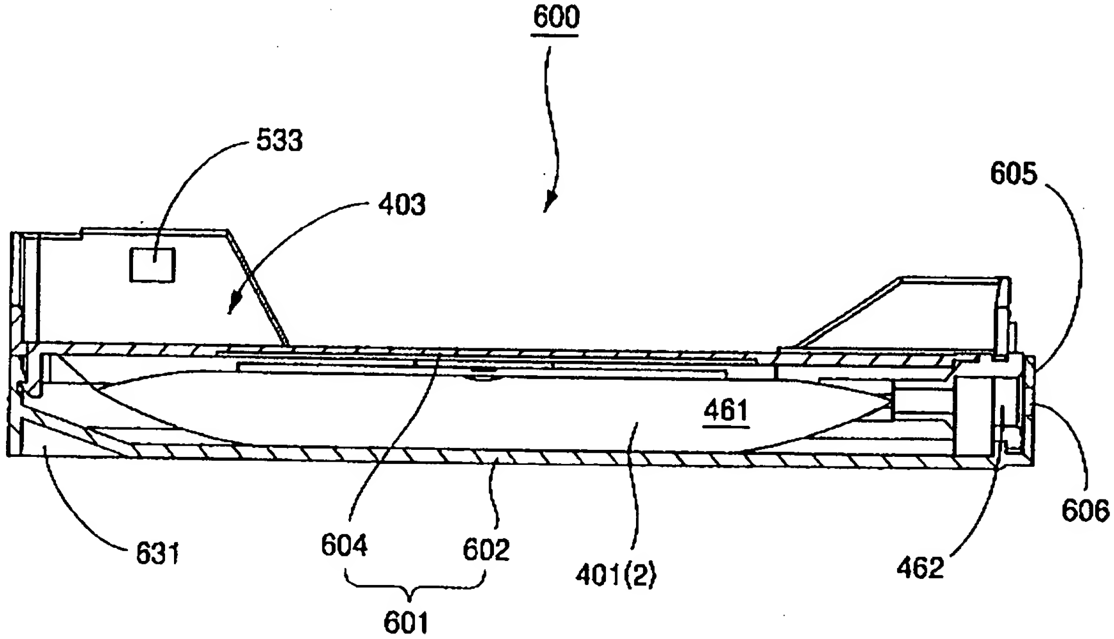

403
600
626
628
622
624
627
533
604
605
625
611
544
623
621
642
644
606
613
641
612
543
643

Fig.27


600
613
604
631
612
543
643
641
605
606
644
642
544
602
611

09771942.013001

Fig.28


600
533
403
605
461
606
462
401(2)
602
604
601
631

09771942.013001

Fig.29

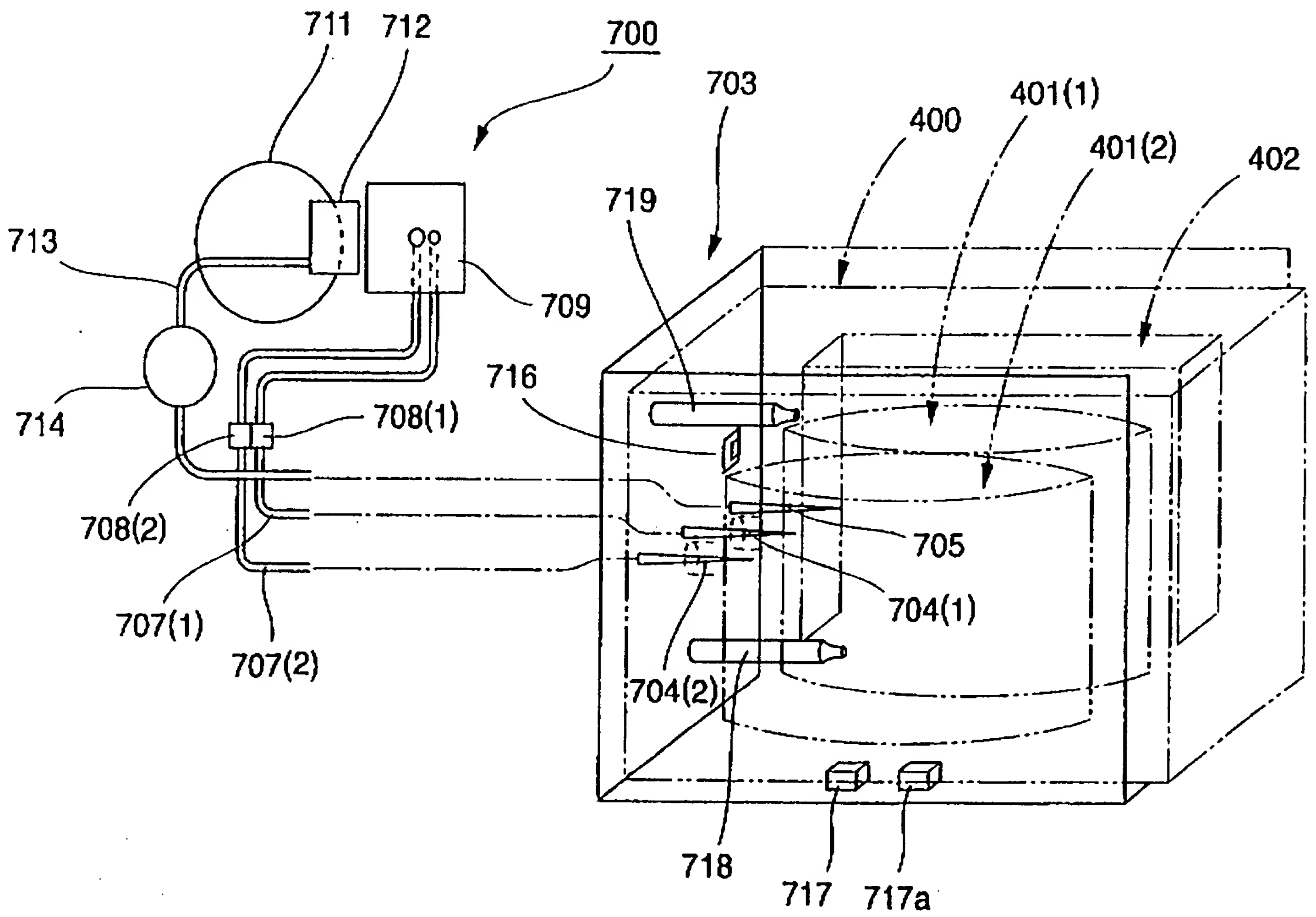

700
711
712
713
714
709
708(1)
708(2)
707(1)
707(2)
703
719
716
400
401(1)
401(2)
402
705
704(1)
704(2)
718
717
717a

Table1: In case of printing without color ink

First ink cartrige 500	second ink cartige 600	ink value for using printing		waste ink value	
		black ink	color ink	black ink	color ink
first	first	a1 (cc)	0 (cc)	(n2/n1) × b1 (cc)	b1 (cc)
	second	a2 (cc)	0 (cc)	(n2/n1) × b2 (cc)	b2 (cc)
	third	a3 (cc)	0 (cc)	(n2/n1) × b3 (cc)	b3 (cc)
	p'th	ap (cc)	0 (cc)	(n2/n1) × bp (cc)	bp (cc)
total			0 (cc)	(n2/n1) × Σbi (cc)	Σbi (cc)
Second (black ink) cartridge		a1+(n2/n1)×b1=a2+(n2/n1)×b2=····=V2			
First (color ink) cartirge		b1+b2+···bp=Σbi=V1			
waste ink value		(n2/n1)×Σbi+Σbi=((n2+n1)/n1)×Σbi			

Table 2: In case of printing with color ink

First ink cartridge 500	Second ink cartridge 600	ink value for using printing		waste ink value	
		black ink	color ink	black ink	color ink
frist	frist	d1 (cc)	c1 (cc)	(n2/n1) × e1 (cc)	e1 (cc)
	second	d2 (cc)	c2 (cc)	(n2/n1) × e2 (cc)	e2 (cc)
	p'th	dq (cc)	cq (cc)	(n2/n1) × eq (cc)	eq (cc)
total			Σci (cc)	(n2/n1) × Σei (cc)	Σei (cc)
Second (black ink) cartridge		d1+(n2/n1) × e1=d2+(n2/n1) × e2=····=V2			
First (color ink) cartrige		(c1+··+cq)+(e1+··+eq)=Σci+Σei=V1			
waste ink		(n2/n1) × Σei+Σei=((n2+n1)/n1) × Σei			